

## Hay's Dock Lerwick (Shetland Islands) - Scotland

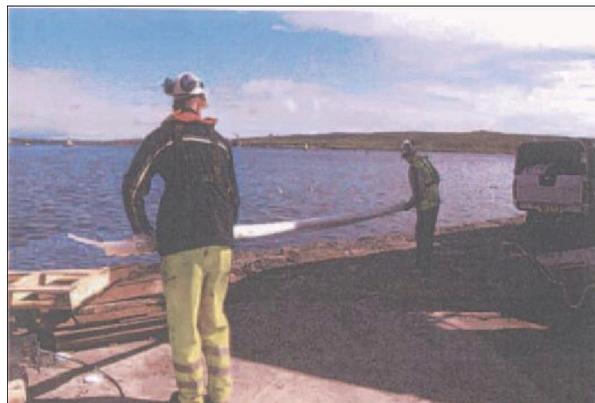
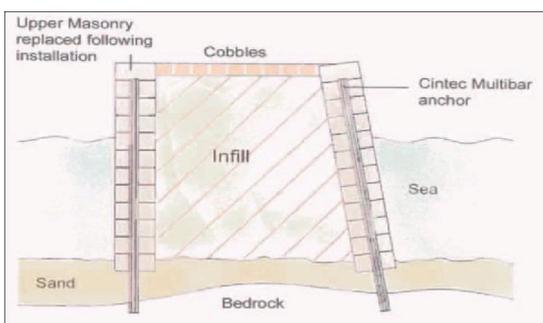
Lerwick is the capital of the Shetland Islands and in the early 1830's became a thriving centre for the herring industry. The foundation for this commercial success lay with the construction of Hay's Dock and a complex of warehouses and curing yards together with all the facilities for building and rigging sailing vessels. The fortunes of the herring industry fluctuated considerably during the 19th century and as vessels became larger and steam power became the norm, a new larger facility was required and subsequently built by the Lerwick Harbor Trust in 1906. The original dock continued to play an important commercial role adapting primarily to the timber trade.



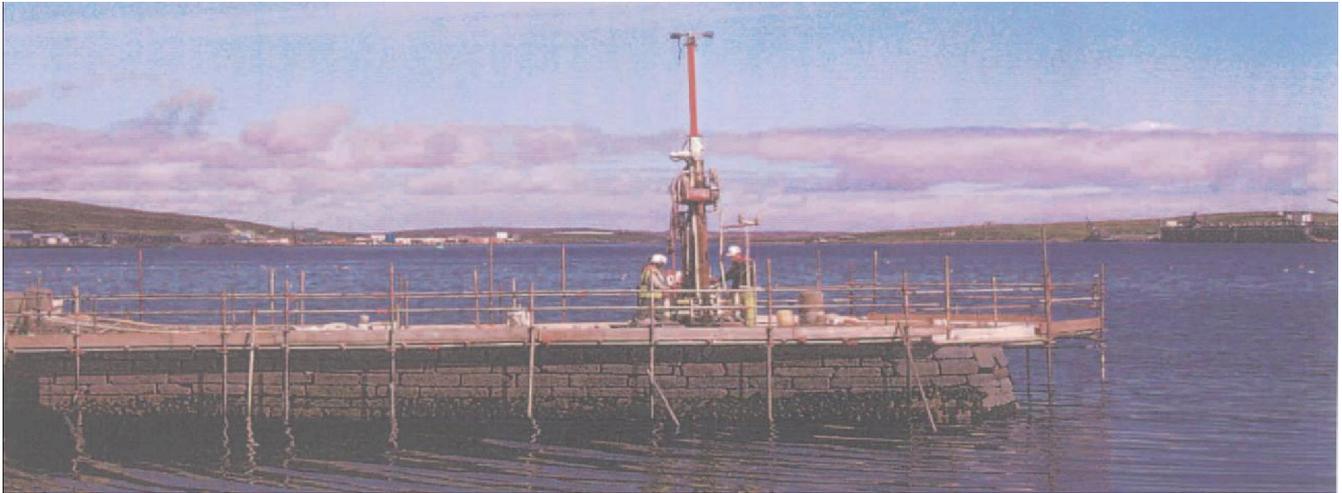
Panorama of Hay's Dock with the Heritage Centre under construction in the background (right), the restoration of the old sail house on the quay (centre right) and Cintec stabilisation work (end of the quay left of sail house).

Today Hay's Dock stands as a monument to the town's industrial heritage and with the assistance of the Shetland Amenity Trust, Historic Scotland and a contribution of lottery funding, the dock area is being rejuvenated with the construction of the new Shetland Museum and Archives building as well as the refurbishment of the old docks itself.

When originally constructed, technology for building underwater was limited. Consequently the foundations of the furthest and hence deepest part of the quay consist of large stone blocks resting upon a layer of relatively unstable sand and gravel. Inevitably, over the last two centuries, the structure has suffered from significant subsidence.



Consulting Engineers Elliott & Company proposed a solution for installing Cintec anchors to both secure the individual blocks of stone masonry and also to underpin the whole structure to the bedrock below. 18 Cintec Multibar anchors were installed by the drilling contractor Holequest Ltd, each anchor being five meters long and consisting of four strands of 16mm diameter 316 high grade stainless steel rebar in square formation. A drill rig was used to diamond bore each 150mm diameter hole prior to the installation of the mulibar anchors. The two man cycle of drilling and installation proceeded at a rate of one anchor extremely variable weather even in the month of June.



High grade stainless steel was chosen to improve the long term resistance to the corrosive effects of the salt water. Before installation, the polyester sock of each anchor was completely saturated in fresh water, not only to facilitate the injection and inflation of the anchor, but also to provide a temporary barrier between the reinforcing bars and the external sea water. The low pressure injection of the cementitious grout expanded the anchors from the far bedrock end upwards and so displaced any sea water within the drilled holes and locking the anchors were installed, the original surface edge stones and inner cobbles were placed back into position, concealing the stabilisation work beneath.

A mobile rig was employed firstly to core drill the anchor holes, then to temporarily install a metal tube hole lining, following by the lifting and lowering of the Cintec anchor (side) and finally the removal of the temporary core lining prior to anchor injection.

